Claim Rejections

Claims 1 - 3 and 23-26 were rejected under 35 U.S.C. 102(b) as anticipated by the Wennerstrum et al., U. S. Patent #4,882,851. The Examiner reasons that the Wennerstrum '851 reference shows an apparatus and method for drying a sample comprising a sealable chamber (10), cold trap (34), pump (40) for creating a vacuum tube, and heating means (12) for supplying electromagnetic energy to the interior of the sealable chamber pressure sensor (76) for measuring the vacuum, and control means (42), which are arranged the same as claimed.

General Comments

The Wennerstrum reference does disclose a vacuum dryer using a microwave to heat the interior of the vacuum chamber. It is designed for batch drying of a powered or particulate product. It is designed to overcome some of the disadvantages of previous microwave vacuum dryers of overcoming the likelihood of uneven microwave distribution within the drying chamber. Wennerstrum points out that a sharp metal point produces a high field strength at the point tips and that the interior of the dryer should be designed with smooth interior curves to produce few, if any, areas of extreme energy concentration. (Wennerstrum Col. 2, lines 5-23) In order to overcome the uneven heating caused by microwaves, a number of expedients have been proposed including rotating drums or rotating trays. As the drying process reaches completion, adjustment of the microwave field is required to compensate for the reduced energy absorbed by the solvents, since less solvent is present in the particulate or powder which is undergoing the drying process. Thus, if the microwave field is not reduced, it leads to a rapid temperature change. In the Wennerstrum design: "Complete drying is rarely desirable." (emphasis added) (Wennerstrum Col. 3 Line 22 ) When describing the operation of the preferred embodiment, Wennerstrum explains that: "In most drying operations the vacuum is pulled until the pressure in the drying chamber is between 10 and 35 TORR." (Col. 13 line 23) The He et al current invention is designed to overcome drawbacks of previous drying methods and apparatus, including the methods disclosed in the Wennerstrum

patent, to achieve the most rapid drying time possible without degrading the sample undergoing the drying process. As is explained in the application on page 2, lines 3-4, drying time in previous methods is a drawback because it does not give an opportunity to take corrective action during a construction project should the density of the sample be outside of the parameters assigned to that project. It is undesirable to have the sample damaged by heat applied during the drying period because other tests may be required (Application, page 2, line 6). It is explained that it is an object of the invention to reduce the drying time required for samples while maintaining the material integrity of the samples (Application, page 4, line 22). In addition to a vacuum, it is explained that, without introduction of heat, evacuation of air from the chamber with resulting vaporization of moisture on a sample will lower the temperatures of the sample to slow the drying process (Application page 6, lines 20 - 22). It is explained that it is desirable to reduce the pressure inside the chamber to below 10 TORR in order to completely dry the sample. (Application page 7 line 15)It is explained that the use of an infrared heat source allows for precise control of the heat inside the chamber so the chamber may be kept within a desirable temperature range without concern that heat will build up in the chamber and degrade the sample. (Application page 8, lines 3 - 6) As is explained on page 11 lines 15 - 18 of the application, the desirable temperatures is room temperature. It is undesirable the temperature become too low, which impedes the drying process or too high, which affects the sample characteristics and could affect other tests other than determination of dry weight or mass. For the most rapid drying, the vacuum in the sample chamber is maintained at the highest level (page 11, lines 22 - 23).

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Claims 1 and 3, are amended to add further limitations to clarity and highlight the novelty of the Applicant's invention. First, each claim is amended to add the constraint that the sample is: "porous". This clause highlights the specific use for which the Applicant's invention is designed, to provide testing for porous materials like those used during construction. The Applicant's

invention is not used for an industrial batch treatment process, as is the Wennerstrum patent. Second, it adds the requirement that the vacuum inside the chamber be increased until the air pressure inside the chamber is less than 10 TORR. This is not disclosed by the Wennerstrum reference, but rather the Wennerstrum reference teaches away from this vacuum level by showing the desirable range inside the vacuum chamber is between 10 and 35 TORR (Col. 13 line 23). Consequently, this invention teaches a vacuum level higher than that taught by the Wennerstrum patent. Next, Claim 1, as amended, adds a step of heating the interior of the sealable chamber to a temperature in a predetermined range. While the Wennerstrum patent teaches the desirability of heating the sample inside the vacuum chamber to facilitate drying of the batch or sample, the purpose of the Wennerstrum is to avoid microwave caused "hot spots" or uneven heating of the batch. Consequently, it teaches the use of an agitator, which is not desirable in the current application, rather than the control of the temperature inside a predetermined range. Here, the sample must be dried in a way so that it may be used for further testing. Consequently, any steps like an agitator that compromises the structural integrity of the sample are undesirable. Thus, Wennerstrum again teaches away from the current invention.

Claim 2 was canceled. Claim 3 was amended to depend on Claim 1 and to add the requirement that the heating step was by supplying infrared energy to the interior of said sealable chamber. Consequently, it is believed Claims 1 and 3, which were previously rejected based on the Wennerstrum reference under the 102(b) basis are no longer anticipated under 102(b) by the Wennerstrum reference. In a like fashion, Claim 23 was amended. Claims 24, 25, and 26 were canceled, and Claim 27 was amended to clarify that the means for heating is an infrared lamp. Consequently, it is believed Claim 23 as amended is no longer anticipated by the Wennerstrum reference. Claims 24, 25, and 26 were canceled.

Claim Rejections 103

Claims 4, 5, 7, 8, 27-28, and 30-31 were rejected under 103(a) as being unpatentable over Wennerstrum in view of Dhaemers, U. S. Patent #5,546,678. The Examiner reasoned that Wennerstrum includes all that is recited in Claims 4, 5, 7, 8, 27-28, and 30-31, except for an infrared lamp for heating the chamber and means for measuring humidity in the chamber. The Examiner stated that Dhaemers teaches a drying apparatus and method with an infrared light (73) for heating the chamber (41) and a humidistat (112) for measuring humidity in the chamber (41). The applicant respectfully traverses the combination of the Examiner.

The combination of Dhaemers and Wennerstrum for the Applicant's elected species as disclosed in Figure 2 is inappropriate. As was explained in the application, Applicant disclosed two embodiments. The Examiner considered these two embodiments to constitute at least two distinct patentable inventions and imposed a restriction requirement. The Applicant elected the species disclosed in Figure 2. In the unelected species, air is heated to a preset temperature and allowed to enter the sealed chamber. Because air is heated before entering the chamber in this embodiment, this heated air must then be directed around the cold trap so as not to affect the temperature within the cold trap (Application page 6, lines 9-15). In the elected embodiment, the sample inside the chamber is heated directly by electromagnetic energy. In some of the claims as amended, this electromagnetic energy is infrared energy, which heats the interior of the chamber directly, even though the infrared lamp may be placed outside of the vacuum chamber (See Figure 2 of the Applicant's invention). The Dhaemers reference simply discloses a large dryer (10) with a housing (11) and a drying chamber (41). A heater (73) is used to heat air (emphasis added) directed by a fan (74) and an air grill (73) into the heating chamber (41). The heater (73) in the preferred embodiment is electric resistance coil but infrared light is also mentioned as a way of heating air to enter the heating chamber (41). In Dhaemers, air freely flows in and out of the chamber, which has some resemblance to the Applicant's unelected species where air is first heated and allowed to enter the

chamber. However, for the Applicant's unelected embodiment where heated air enters the chamber in a fashion similar to the Dhaemers reference, the Examiner imposed a restriction requirement, thus finding that the unelected heated air embodiment and the Applicant' s elected embodiment were patentably distinct inventions. Thus, by the Examiner's reasoning, the Dhaemers reference is inappropriate to combine with Wennerstrum since the use of heated air versus direct infrared energy is a nonobvious change constituting patentably distinct subject matter, otherwise, the restriction requirement should not have been imposed.

Apart from the above consideration, infrared energy has advantages for a high vacuum sample chamber, which are not disclosed by the Wennerstrum microwave energy source or Dhaemers heated air. Wennerstrum recognizes that microwave energy can create "hot spots" in material contained within the vacuum chamber. Wennerstrum proposes overcoming these "hot spots" by use of agitators. However, agitators are unacceptable for the Applicant's elected embodiment. In that embodiment, the sample place inside of the Applicant's vacuum chamber is porous material which may be subject to further testing. Consequently, anything that destroys or changes the material integrity of the sample is unacceptable for the Applicant's invention. Consequently, use of the Wennerstrum microwaves could result in unacceptable "hot spots" in the Applicant's sample materials. Heating air to enter the chamber, as is suggested by the Dhaemers reference, does nothing to overcome the "hot spot" deficiency of the Wennerstrum reference since during the Applicant's vacuum process the chamber is closed and evacuated so that the air pressure within the chamber is less than 10 TORR (as is now claimed). Thus, heated air entering the sealed chamber cannot be used to maintain a temperature range in the sample chamber. Consequently, the use of infrared energy to directly heat the chamber (not to heat air entering the chamber as is suggested by the Dhaemers reference) solves the problem of "hot spots." The source of infrared energy may be inside the chamber, or outside the chamber as is shown in Figure 2. Consequently, Dhaemers does nothing to suggest the use of infrared energy to directly heat a sample within a

chamber as opposed to heat air entering a chamber. By the Examiner's own reasoning, heating air to enter a chamber is a patentably distinct embodiment different from the Applicant's elected embodiment and the claims arising from that embodiment.

Moreover, adding Dhaemers to Wennerstrum does not correct the essential deficiencies of Wennerstrum regarding the need for a vacuum greater than 10 TORR nor the need to heat the chamber in a controlled fashion to temperature in a predetermined range. For these reasons, it is believed that Dhaemers is inappropriate to combine with Wennerstrum and, even if combined with Wennerstrum, does nothing to render the essential deficiencies of Wennerstrum. Consequently, Claims 4, 5, 7, 8, 27 and 28, and 30 and 31 are allowed as amended.

Claims 6, 9, 29, 33-34 were rejected under 103(a) as being unpatentable over Wennerstrum in view of Dhaemers and in view of Hunter et al., U. S. Patent #6,085.443. The addition of Hunter to Dhaemers and Wennerstrum does nothing to overcome the essential deficiencies of the combination of Dhaemers and Wennerstrum nor does it suggest why Dhaemers may be combined with Wennerstrum in view of the restriction requirement imposed by the Examiner. The Applicant will not repeat the arguments given above regarding the deficiencies of Dhaemers and Wennerstrum but incorporates those arguments by reference herein.

Claims 10, 21, and 32 were rejected under 35 U.S.C. 103(a) as being unpatentable over the combination of Wennerstrum in view of Dhaemers and in view of Davis, U. S. Patent #6,410,889. The addition of Davis does nothing to overcome the essential deficiencies of Wennerstrum, as was argued above, nor does it suggest the combination of Dhaemers with Wennerstrum. The Applicant will not repeat the above arguments herein but incorporates them by reference. Consequently, it is believed that Claims 10, 21, and 32 are now allowable with amendments as has been previously shown.

Conclusion

Applicant has responded to the 102 rejection by Wennerstrum by amending the claims to further distinguish the Applicant's elected species from Wennerstrum. The Applicant has further explained that the combination of Dhaemers with Wennerstrum is inappropriate in view of the restriction requirement imposed by the Examiner. Moreover, even the combination of Wennerstrum with Dhaemers where Dhaemers' is used to heat air to enter the chamber, does nothing to render obvious the Applicant's use of infrared light to directly heat the sample within the chamber to a controlled temperature range. The addition of Hunter or Davis to Dhaemers and Wennerstrum do nothing to remedy the essential deficiencies of those references either singly or in combination. Consequently, it is believed that all claims remaining in the application are in a condition for allowance and the same if respectfully requested from the Applicant.

This the 22 day of March, 2005.

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